CLAIMS

1. A high-pressure fluid nozzle comprising a plurality of segments, each segment having an axial bore extending therethrough, the bore of each segment being aligned with the bore of each other segment to form a continuous fluid passage through the plurality of segments, and a containment sleeve for coupling the segments together.

2. The nozzle of claim 1 wherein the containment sleeve is a metallic sleeve shrink-fitted around the segments.

3. The nozzle of claim 1 wherein the containment sleeve is press-fit around the segments.

4. The nozzle of claim 1 wherein the containment sleeve is formed around the segments by metal spray forming.

5. The nozzle of claim 1 wherein the nozzle has a selected length achieved by coupling together a selected number of the segments each segment having a selected length.

6. The nozzle of claim 5 wherein the length of each segment is 0.125-0.75 inch.

7. The nozzle of claim 1 wherein the segments are of different inner dimensions.

8. The nozzle of claim 7 wherein the inner diameter of an uppermost segment is greater than the inner diameter of the remaining segments.

9. The nozzle of claim 1 wherein at least one of the segments is spaced axially from an adjacent segment to form a chamber, and an auxiliary port is in fluid communication with the chamber to connect the chamber to an auxiliary material source.

10. The nozzle of claim 9 wherein the auxiliary material source is air.

11. The nozzle of claim 9 wherein the auxiliary material source is fluid.

12. The nozzle of claim 9 wherein the auxiliary material source is abrasive.

13. The nozzle of claim 9 wherein the containment sleeve is a metallic sleeve shrink-fitted around the segments.

14. The nozzle of claim 9 wherein the containment sleeve is press-fit around the segments.

15. The nozzle of claim 9 wherein the containment sleeve is formed around the segments by metal spray forming.

16. The nozzle of claim 1 wherein several of the segments are spaced axially from adjacent segments to form multiple chambers, a separate port communicating with each chamber.

17. The nozzle of claim 1, at least one of the segments spaced axially from an adjacent segment to form a chamber, and including at least one sensor in the chamber.

18. The nozzle of claim 17 wherein the sensor senses fluidjet pressure.

19. The nozzle of claim 17 wherein the sensor senses fluidjet temperature.

20. The nozzle of claim 1 wherein the bores of the segments are of varying diameter.

21. The nozzle of claim 20 wherein the bores of the segments near an inlet end of the nozzle are larger than the bores of the segments near a discharge end of the nozzle to form a converging fluid passageway.

22. The nozzle of claim 20 wherein the bores of the segments near an inlet end of the nozzle are smaller than the bores of the segments near a discharge end of the nozzle to form a diverging fluid passageway.

23. The nozzle of claim 1 wherein the segments are formed from different selected materials to achieve a desired wear performance.

24. The nozzle of claim 1, further including a jewel orifice coupled to the nozzle upstream of an inlet end of the nozzle.

25. A nozzle for directing a high pressure fluidjet, the nozzle having a plurality of segments aligned axially adjacent one another, each segment having an axial fluid passage, the fluid passage of each segment being aligned with the fluid passage of an adjacent segment, the number and length of the segments being selected to determine the overall length of the nozzle.

26. A high-pressure abrasive fluidjet system comprising:

a source of high pressure fluid in fluid communication with an orifice to form a high-pressure fluidjet in a head;

a source of abrasive material coupled to the head; and

a mixing tube coupled to the head, the abrasive and high-pressure fluidjet passing through the mixing tube to exit the mixing tube as a high-pressure abrasive fluidjet, the mixing tube comprising a plurality of segments, each segment having an axial bore extending therethrough, the bore of each segment being aligned with the bore of each other segment to form a continuous fluid passage through the plurality of segments, the plurality of segments being coupled together by a sleeve.

27. The nozzle of claim 26 wherein the containment sleeve is a metallic sleeve shrink-fitted around the segments.

28. The nozzle of claim 26 wherein the containment sleeve is formed by metal spray forming.

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29. The nozzle of claim 26 wherein the containment sleeve is press-fit around the segments.

30. The nozzle of claim 26 wherein at least one of the segments is spaced axially from an adjacent segment to form a chamber, and an auxiliary port is in fluid communication with the chamber to connect the chamber to an auxiliary material source.

31. The nozzle of claim 26, at least one of the segments spaced axially from an adjacent segment to form a chamber, and including at least one sensor in the chamber.

32. The nozzle of claim 26 wherein the bores of the segments are of varying diameter.

33. The nozzle of claim 26 wherein the segments are formed from different selected materials to achieve a desired wear performance.

34. A method of constructing a high pressure fluidjet nozzle having an inlet end and a discharge end, comprising:

forming a plurality of individual segments, each having an axial bore; and

joining the segments with the axial bores aligned with one another to form a fluidjet passage between the inlet end of the nozzle and the discharge end.

35. The method of claim 34, further comprising spacing at least two of the segments axially from one another to form a chamber between the segments through which a material may be introduced into the nozzle.

36. The method of claim 34, further comprising spacing at least one of the segments axially from another adjacent segment to form a gap through which one or both of the temperature and pressure of the jet may be sensed.

37. The method of claim 34, further comprising shrink-fitting a metallic sleeve around the segments to couple the segments.

38. The method of claim 34, further comprising press-fitting a sleeve around the segments.

39. The method of claim 34, further comprising forming a sleeve around the segments by metal spray forming.

40. The method of claim 34 wherein the axial bore of one segment is wider than the axial bore of an adjacent segment, and the step of joining the segments includes placing the segment with the wider bore closer to the inlet end of the nozzle than the discharge end of the nozzle to form a converging fluidjet passage from the inlet end of the nozzle to the discharge end.

41. The method of claim 34 wherein the axial bore of one segment is larger than the axial bore of an adjacent segment, and the step of joining the segments includes placing the segment with the larger bore closer to the discharge end of the nozzle to form a diverging fluidjet passage from the inlet end of the nozzle to the discharge end.

42. The method of claim 34, further comprising coupling a jewel orifice to the inlet end of the nozzle in axial alignment with the bores in the segments.